

# SGT NEWS



Compiled and  
published by  
FMJ  
International  
Publications  
Ltd on behalf  
of the Society  
of Glass  
Technology

## ADVANCES IN AMORPHOUS STATE CHEMISTRY



### AROUND THE SECTIONS

The following meetings are planned by local sections during April and May... the AGM season!

#### LONDON

A young speakers evening is planned for Tuesday April 20, while the Annual General Meeting is arranged for Tuesday May 18.

#### MIDLANDS

On Monday April 5, the AGM will be followed by a presentation entitled 'Windows' and given by Professor Michael Cable, University of Sheffield.

#### NORTH EAST

Tuesday May 11 is the AGM date.

#### NORTH WEST

The section's annual dinner and dance takes place on Friday April 16, with the AGM planned for Tuesday May 11.

#### YORKSHIRE

'Further developments in oxy-fuel melting' is the theme of a presentation from BOC Ltd, to be given on Thursday April 1. Provisional date for the AGM is Thursday May 6 at Waterstone Glass Ltd.

The Basic Science and Technology Committee of the Society and the Applied Solid State Chemistry Group of the Royal Society of Chemistry joined together to present a one day conference on advances being made in glass science. Prominent workers presented papers on investigations of the structure, sol-gel process and electro-optic phenomena of glasses. Poster papers reporting the very latest developments supported the three subject areas.

Professor C R A Catlow of the Royal Institution began the first session on structural aspects with a paper on the modelling of silicate glass structures. High performance computers are now being used to simulate the movement of structural units with heating. As temperature increases, the phases change until a liquid state is attained, a 'quench' is then applied to the model to leave a solid with a disordered long range structure.

The introduction of alkali metal cations as modifiers was also simulated and homogeneous 'channels' with ions having co-ordinations as high as 4 or

6 were noted. The simulation was found to have a fair relation to the radial distribution function and thus supports the model.

The use of nuclear magnetic resonance to study the amorphous state was explained by Professor R Dupree of the University of Warwick. The shift in resonance peaks due to near neighbours, changes in co-ordination as a function of cooling rate, structural differences in melt and sol-gel derived glasses, the presence of volatile components and the early detection of crystallisation are all possible by this examination technique.

The second session on sol-gel processing began with a talk by Professor

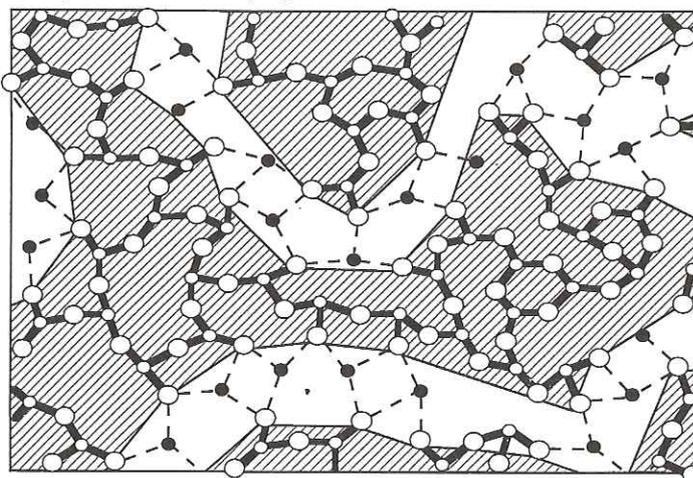
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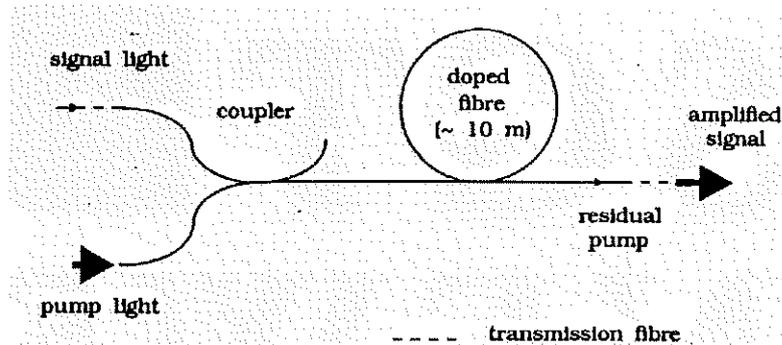
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Modified random network for glass structure.



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*Simplified schematic of a fibre amplifier.*

H Schmidt of the Institut für Neue Materialien, Saarbrücken. He concentrated on the sol phase of this novel technique for producing glass. The size and type of organic components used can determine the final particle size and control the agglomeration. This is an exciting area where there is great potential for a form of micro-engineering molecular and nanocomposites. Applications such as optical waveguides, semi-conducting quantum dots, protective coatings with high structural integrity and erasable holographics are presently foreseeable. Dehydration and devolatilisation are still the most pressing problems.

Professor T A King of the University of Manchester provided an insight into the sol-gel process for optical and electro-optic applications. He concentrated primarily on the stabilisation, dehydration and densification stages and the opportunities for the introduction of organic and inorganic optically-active

compounds, either as a coating or within the partially densified structure. Edge illuminated holography is one of the areas opening up for real development.

The third session of the day concentrated on the leap from electronic to optical amplifiers which has revolutionised the communications industry. Professor D N Payne of Southampton University reported on the development of rare earth doped optical fibres which are the ideal amplifier and laser medium. Remarkable gains and power outputs are being attained but the search is still on to develop new glass and dopant combinations which have higher gains and lower losses at wider wavelengths. Germanates, phosphates, halides and chalcogenides are potentially better than silicates but they are difficult to process or are less thermally stable. Research is continuing and the range of devices is expanding.

The basic chemistry and physics of the factors influencing the performance of rare earth doped fibre lasers and amplifiers were discussed by Dr S T Davey of British Telecom. Current research at the company is concentrating on ZBLAN fluoride glasses for even higher performance waveguides. Getting the right rare earth dopant to produce the desired wavelength of optical signal involves consultation with energy level diagrams and manipulation of the composition to provide the optimum environment for the signal.

With a wider understanding of the nature of glass comes a greater number of applications. The potential for telecommunications alone is immense, from transmitting multi-channel television to replacing satellites with a global network of optical cables, glass will be the enabling factor. The need for new means to model, produce and manipulate this sophisticated state of matter continues.

## COMMITTEE FOCUS

The Basic Science and Technology Committee was established by Council on 13 November 1973 to "provide a forum where problems of glass technology could be discussed in a thoroughly fundamental manner but with a background of technology to which the findings could be applied". The initial steps in its formation were taken by Professor (then Dr) Harold Rawson, still a serving member of the committee. Their first meeting was on pure glass systems in December 1974 and it has been actively promoting understanding ever since.

Further details on activities and membership of the committee can be obtained from the chairman through the Society.



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### IN PRINT

The April 1993 issue of *Glass Technology* features three papers on the relationship between training and quality. Posters from the October 1992 meeting on the 'Science and Art in Glass' are also presented.

*Physics and Chemistry of Glasses* has papers on NMR resonance studies of borosilicate glasses, a centrifuge method to study ion exchange, sulphate as a selective redox buffer for borosilicate melts, cuprous-cupric redox equilibria, Mössbauer spectroscopy of densified glasses and leaching from glass.

## NEW PUBLICATION

The full papers and posters of 'Advances in Amorphous State Chemistry', the one-day meeting reviewed this month, will appear in the launch issue of a new publication from the Society of Glass Technology. *Topical Issues in Glass* will be used as a vehicle to rapidly produce proceedings, dissertations and monographs which report the advancement of all areas of research, development and practise for the glass technologist.

The first issue, *Topical Issues in Glass*, costs £20.00 and is available from the main office of the Society.